Light and Lighting

Official Journal of the Illuminating Engineering Society.

Incorporating "The Illuminating Engineer."

32, Victoria St., London, S.W.1.

Edited by J. STEWART DOW

Telephone: ABBey 5215

Vol. XXXVII.—No. 9 **September, 1944** PRICE NINEPENCE Subscription 10/6 per annum, post free

	Page
Editorial Notes ...	133
Notes and News ...	134
The Lighting of Houses and Schools	136
The Value of Good Lighting	142
Street Lighting and the War	144
The Editor Replies ...	148

The Passing of the Shadow

THE promise of a substantial relaxation of black-out regulations, commencing on September 17 with the ending of double Summer Time, was as welcome as it was, to most people, unexpected.

At the moment of writing full details of the order of permissible street lighting are still awaited; but it is understood that (except in a few special coastal areas) "half lighting," which is described as roughly equivalent to pre-war side-street lighting, will be allowed, provided no light is emitted above the horizontal.

This rough indication contrasts strangely with the precision with which "synthetic starlight" was defined. Compliance with the regulations will involve some improvisation, so that an instant response—such as would be much more feasible were full pre-war restoration permitted—can hardly be expected. London, it is now understood, may have to wait a little owing to technical difficulties, but in some areas where a "master switch" (magic word!) can be applied improvements may be introduced immediately.

This promise of alleviation is, however, welcome. It has been widely declared that of all wartime privations the black-out has been the worst. Now the shadow is to be at least partially lifted.

Codes of Practice

We give elsewhere (pp. 136-140) a summary of the draft "Code of Practice" recently issued by the British Standards Institution, relating to the future lighting of homes and schools. This is only one of many such codes being prepared by the Code of Practice Committee operating under the aegis of the Ministry of Works. They represent an entirely new departure and a most interesting one. It is very satisfactory to find that lighting is not being forgotten, but is being actively studied by this Committee, with which the I.E.S. is now associated. The code is not intended to be mandatory, but it will no doubt afford useful guidance and will profoundly influence future practice. The standards prescribed are neither impracticable nor excessive in view of modern requirements—indeed, in many cases, especially when fluorescent lamps come into general use, higher values of illumination may well be realised. It is also likely that many householders will wish to be more generous in their use of light than the Code suggests. The lighting of homes is much the larger problem, but one in which reasonable latitude to suit individual taste must be allowed. In schools the problem is different. Everyone will feel that in this case the need for good lighting is even more urgent, and that it should be incumbent on authorities to see that the requirements of the Code are fully met.

I.E.S. North Midland Activities

We have been favoured with a copy of the card containing particulars of forthcoming meetings in the North Midland area, which make quite an imposing list. Altogether there are over thirty events listed for the Leeds Centre, the Bradford Group and the Huddersfield Group, and there are included several meetings in Halifax, where no actual group exists as yet, though no doubt this is only a question of time. The programme (which will be incorporated in the complete list of I.E.S. meetings now being in preparation) shows evidence of fruitful consultation between the three bodies mentioned. Several papers figuring in the Sessional meetings in London are being repeated in Bradford. It is interesting to note that not only are the Christmas lectures to school children, inaugurated in that city last year, to be repeated, but a similar effort is now being made in Leeds. Mr. R. Pye, the hon. secretary of the Leeds Centre, to whom we are indebted for the above particulars, also sends us a copy of the circular notice to members summarising the contents of the recent issues of "Illuminating Engineering" (the journal of the American I.E.S.), which, we gather, have been in great demand. This is an idea that seems worth consideration by other Centres, which also receive copies of this interesting American publication.

I.E.S. Nottingham Centre

Annual General Meeting

As we go to press we receive some particulars of the above event, which took place on September 5, and was attended by the Lord Mayor and Lady Mayoress of Nottingham. A feature was the address of the incoming chairman, Mr. E. G. Phillips, on which we hope to comment at greater length in a coming issue. The address was both interesting and provocative.

Mr. Phillips, who took natural and artificial lighting in his stride, pointed out many weaknesses and anomalies in present day methods. He ended up by stressing the need for co-operation between the illuminating engineer and the architect and "Illumination throughout the 24 hours . . . the responsibility of an expert specialising in both natural and artificial forms of light sources."

At the annual meeting, preceded by a luncheon at the Mikado Cafe, Mr. R. Gillespie Williams was elected vice-chairman for the ensuing year. The annual report was submitted by the hon. secretary, Mr. C. S. Caunt, who drew attention to the increased membership of the Centre and its Groups. The Society was congratulated by the Lord Mayor, who told the members present "There is a great field for exploration. You engineers have a splendid opportunity."

The Colour Group

The 18th meeting of the Colour Group of the Physical Society, will take place at the E.L.M.A. Lighting Service Bureau (2, Savoy Hill, London, W.C.), at 3.30 p.m. on September 20. A lecture on "Illuminants for Colorimetry and the Colours of Total Radiators will be delivered by Mr. H. G. W. Harding (National Physical Laboratory).

Road Accidents in May

The record of road accidents in May, when summer conditions are approaching, is often instructive. The figures for the present year, published in *Safety News*, are surprising because the total killed (632) is so much more than in 1943 (431), and indeed has only once been exceeded in the month of May, namely, in May, 1941. Until quite recently there has been a progressive decrease since the worst "peak" of accidents. In view of the long daylight period, the number of fatal accidents in darkness (82) naturally formed only a small proportion of the whole, though distinctly greater than in 1932 (56). When one considers "Total Injured," however, one observes a curious fact. During hours of darkness the number was 1,042, as compared with 553 in 1943—a rise of nearly 100 per cent.; whereas during "other hours" the increase, from 8,419 to 10,440, was of the order of 25 per cent. only. This does seem to suggest that, even in such a month as May, driving in the black-out is a serious factor; another odd fact is the great increase in accidents to drivers of mechanically propelled vehicles, from 67 to 152, an increase, surprisingly, much greater than that for pedestrians (from 142 to 204).

(Since writing the above, we have received similar data for June, which reveal tendencies similar to those noted above.)

I.E.S. Opening Sessional Meeting

The **opening Sessional I.E.S. Meeting** in London will take place on **October 10, 1944,** when the **Address of the incoming President,** Mr. E. Stroud, will be delivered.

The meeting will be held at the E.L.M.A. Lighting Service Bureau (2, Savoy Hill, London, W.C.) at **5 p.m.**

For particulars of other prospective I.E.S. meetings, in London and elsewhere, readers are referred to the Provisional Programme published in the I.E.S. Transactions (September, 1944).

Post-War Lighting in Houses and Schools

(Communicated)

In what follows we present a specially prepared review of the contents of the draft Code on the Lighting of Houses and Schools, recently issued for discussion by the British Standards Association on behalf of the Codes of Practice Committee formed under the aegis of the Ministry of Works.

The Codes of Practice Committee, recently set up by the Ministry of Works, has just produced a document which cannot fail to be of great interest to all readers of "Light and Lighting." It is Chapter VII. (A) of the Interim Code of Functional Requirements for Dwellings and Schools, and deals with the provision of artificial light in such buildings. The document is a first draft, and has been circulated for comment to all organisations concerned with the lighting of domestic and educational buildings, so that the following brief digest of the principal contents can only be regarded as indicating provisionally the lines upon which the final Code will probably be drafted.

It should, perhaps, first be explained that the Codes of Practice Committee consists of "nominees of the principal Technical Institutions, the British Standards Institution, and the Building Industries National Council, with assessor members nominated by certain Government Departments, and a chairman appointed by the Minister of Works." Its task is to prepare a comprehensive scheme of codes of practice for all types of buildings, beginning with dwellings and schools, and extending later to other classes of buildings. The codes are to be in two categories. First there is the "Code of Functional Requirements," which is in ten chapters, and deals with such matters as ventilation, heating, lighting, fire-prevention, etc., in a general way, i.e., independently of the type of equipment installed for providing the service in question. Thus the present draft of Chapter VII. (A) contains recommendations for lighting which are applicable to either of the two usual illuminants.

The other codes are more specific, in that they deal with particular means for complying with the recommendations in the Code of Functional Requirements. Among these, therefore, there will be codes dealing with gas lighting and electric lighting as separate matters, and the code to be followed in any particular house or school will be that appropriate to the supply available or selected for the building in question.

Some Important General Principles

The chapter is divided into two parts, dealing respectively with dwellings and with schools. The first part opens with a general section, in which it is pointed out that the lighting in a home should be so designed as to give ease and comfort both for work and for the leisure occupations which the members of the family may desire to carry out. This section contains two important sentences, which are so vital to the understanding and use of the Code that they must be quoted here in full. The first deals with the matter of adequacy, and states: "It should be borne in mind that the standards of illumination which have

been regarded as sufficient have shown a steady rise, and that this tendency is likely to continue, especially as more efficient sources of light become available." The second embodies a new principle which every illuminating engineer and, in fact, anyone anxious to see the homes of the people well lighted cannot but heartily endorse. "Artificial lighting should be considered as much an integral part of the design of the building as are the windows provided for natural lighting, and the equipment should be installed at the time of construction."

The familiar plea for early co-operation between the architect and the lighting engineer is reiterated, and, as an indication of the many factors on which the effectiveness of any lighting scheme depends, the principal ones (apart from the actual foot-candles needed) are listed. It is pointed out that a reasonably light-toned decoration is desirable in most cases, and for kitchens and sculleries a reflection factor of 70 per cent. is to be aimed at unless the sizes of source recommended in a later section of the chapter are to be increased. The influence of the light distribution from the fittings, as affecting the quality of the lighting, is mentioned in this connection, and some useful hints to the non-technical are included. Among these are references to the "flatness" of totally indirect lighting and its inefficiency unless ceilings are kept clean and white, and to the "tunnel effect" of direct lighting fittings and their tendency to produce glare.

There is a welcome mention of the desirability of ease of maintenance of fittings, concluding with a sentence which might be put into the form of a slogan, "the harder to get at, the less they'll be cleaned." The provision of plug points for local lighting is strongly recommended, and it is pointed out that in many cases the general lighting in a room may well be of a standard lower than that required for specific and possibly exacting tasks, such as sewing, reading, or the children's homework.

Standards of Illumination

These statements of general principles are followed by three pages giving the illumination standards to be aimed at in the various parts of a home. These values are given in a somewhat novel form, and the reason for this will soon become clear to anyone who sits down to the task of drawing up recommendations for the number of foot-candles to be provided in, say, a kitchen or a living-room. In the kitchen, for instance, a fairly high standard of illumination is required at the cooker, the sink, and the table where food is usually prepared. The Illuminating Engineering Society's Code prescribes 6 to 10 foot-candles at all these places. To recommend this value of illumination all over the room might well be uneconomical, but, on the other hand, the other parts of the kitchen can by no means be neglected altogether.

Similar considerations apply with even greater force in the case of the living-room. Here a uniform level of illumination all over the room at table height is quite unnecessary and the usual, and perfectly satisfactory arrangement as regards the general lighting, is to have a single source, or sometimes two sources, providing a good light but a far from even illumination. Usually it is over the table and by the fireplace that the light is chiefly wanted for meals, for conversation or for sitting down and listening to the radio. The sides of the room can have a much lower standard without any detriment to the occupants, provided there are suitably placed plugs for the provision of local lighting by means of a table or standard lamp whenever something calling for more light has to be done. Any recommendation of a given number of foot-candles over the working plane is, therefore, a quite

unsuitable way of specifying the lighting of a living room.

Kitchens

The Code, as now proposed, proceeds on quite different lines as far as dwellings are concerned. In the case of kitchens, for example, in addition to giving the I.E.S. Code value as a "recommended illumination" for the cooker, sink, and work-table, there is a fairly detailed recommendation for the number and size of sources regarded as the "minimum provision compatible with good lighting" in a kitchen. This may be quoted as an example, typical of the way in which the Code deals with the various rooms and other locations in a dwelling house. It reads as follows:—

"Usually two points with separate switching or other type of control, conveniently disposed to avoid shadowing of sink, cooker, and table.

For rooms up to 80 sq. ft. area:—

Electric lamps—total 100-watts, or
Gas mantles—one B.S.4 and one B.S.1, or equivalent.

For rooms 80-120 sq. ft. area:—

Electric lamps—total 115-watts, or
Gas mantles—one B.S.4 and one B.S.1, or equivalent.

The fittings to be of an overall efficiency of not less than 70 per cent., having a maximum brightness of 10 foot-candles per sq. in. at any angle of view between the horizontal and 30 deg. below the horizontal. The light distribution from the fitting should be such that at least one quarter is emitted upwards and at least one-half downwards."

Living Rooms

In the living room the recommendation is for "one or two fixed fittings for general lighting," and three additional plug points. The size of lamps recommended depends on the area of the room and the type of fitting chosen. Fittings are classified in three groups as follows: A, mainly direct, emitting at least 70 per cent. of the light downwards; C, mainly indirect, emitting at least 70 per cent. upwards, and B intermediate between A and C. Appendix A in the Code has a chart from which it is easy to find the size of electric lamps or gas mantles recommended for a living room of any given area, using reasonably efficient fittings (60 per cent.) of either of the three types A, B, or C—though it is stated that C type fittings are not generally used with gas.

Bedrooms

In the case of bedrooms where (as is often the case) the position of the furniture can be regarded as known, the recommendation is for one bed-head light, one light to serve for the dressing table and as a general room light and one plug. Where the position of the furniture is unknown, one general light and two plug points are recommended.

For bathrooms a 60-watt lamp or a B.S.3 gas mantle is prescribed. This might at first appear unnecessarily large, but when it is remembered that the installation cost is practically the same whatever the size of source, and that the burning period in a bathroom is very small, the recommendation is seen to be fully justified.

Stairs and other Places

In the case of stairs there is a very useful provision as regards the arrangement of the lighting. It is recommended that the source (in a fitting of type A or type B) shall be so placed that each tread throws a shadow covering between one-quarter and three-quarters of the width of the tread beneath. This enables anyone descending the stairs to see very easily the position of the edge of each tread and the height of each step. The recommendation for cupboards, w.c.'s, washhouses, entrance doors, and communal stairs and corridors (in the case of flats) call for no special comment, but there is a useful remark, in connection with the lighting of halls and passages, that the light source should be "preferably out of the field of vision of persons

descending the stairs; if this is not possible, the fitting should have a brightness not exceeding 10 foot-candles per sq. in. in any direction within the field of view of a person descending the stairs.

Schools

The lines followed in making recommendations for school lighting are quite different from those considered appropriate in the case of dwellings. The lighting of a house is usually carried out by the builder (private or municipal) either by himself or in consultation with the prospective occupant. Scarcely ever is there any expert advice available so that the more or less detailed guidance given in the Code should be found extremely valuable. In the case of schools, however, matters are quite different. These buildings are erected by large local authorities who have their own architectural staff and their own engineering department. There should, therefore, be no excuse for bad lighting, and the situation is summed up in the recommendation at the end of the opening paragraph of Part II. of the Code, which reads, "Every installation should be designed by a lighting engineer, following the guidance given in this code."

After a statement of the main lighting requirements in classrooms the Code repeats the plea for *early* co-operation between architect and lighting engineer, and mentions the information with which the latter should be furnished in order that he may design to the best advantage. It is pointed out that not only the tone of the decoration but also that of the furniture in a classroom may have a marked influence on the effectiveness of the lighting system. A diversity factor of not more than 1.5 is prescribed over the seating area in a classroom and the importance of upward light to give a bright and cheerful appearance to the room is mentioned.

There is a very specific recommendation as regards the avoidance of glare, as follows: "In classrooms and lecture theatres no luminous part of a light fitting should be less than 9 ft. above the floor level immediately below the fitting. Where a fitting is mounted less than 16 ft. above floor level, the brightness for any angle of view between the horizontal and 45 deg. below the horizontal should preferably be 2-3 foot-candles per sq. in., and should not exceed 5 candles per sq. in."

In the matter of maintenance, again, this should be carried out by trained personnel, and it is recommended that there should be regular inspection, "including measurements with a light-meter."

Standards of School Lighting

As regards the actual standards of illumination to be provided, these again have been based on the I.E.S. Code values, though instead of a range, a single value of illumination has been recommended. Further, in the case of classrooms the value chosen is 12 foot-candles, which is in accord with the recommendations made by the Board of Education, and also with the latest edition of the I.E.S. Code. The vertical illumination of the chalk-board is also set at 12 foot-candles to be provided by special lighting at that end of the room. For laboratories, workshops, art rooms, sewing rooms, and drawing offices the same standard of 12 foot-candles is recommended, with supplementary lighting to suit the layout and the work to be carried on. An interesting recommendation is that the "Lighting of workshops and similar trade rooms should be as installed in modern industrial plants." For assembly halls, dining rooms and gymnasia 8 foot-candles is recommended, again with special lighting as required (e.g., stage lighting). The recommendations for staffrooms, libraries, corridors, and stairs call for no special mention. There is, however, a small-type footnote which must not be overlooked. It reads: "Classrooms designed primarily for the use of partially-sighted children require special consideration."

It may, perhaps, be mentioned here

that the values of illumination quoted are, as in the case of the I.E.S. Code, all *service values*, and it is pointed out that the design values should be 40 per cent. in excess of the figures given so as to allow for depreciation in service.

Artificial Light to Supplement Daylight

The Code has an interesting section dealing with the use of artificial light to supplement daylight in schools. It points out that for considerable periods in winter this is necessary in most classrooms, over the whole or part of the room. The recommendations for such supplementary lighting are as follows:—

"(a) The total illumination thus provided should not be less than that recommended if the area affected were being lit solely by artificial light.

(b) The artificial light sources should:

(i) be so selected and placed as to give a light which blends well with natural light, thus reproducing those qualities of diffusion and colour which are associated with daylight;

(ii) be so controlled that the lighting over areas likely to suffer first from lack of natural lighting can be successively brought into use as required."

The photo-electric control of such supplementary light is also mentioned.

A Great Advance

From the brief summary given above it will be clear that this Code, when issued, will be a most valuable instrument in raising the standard of lighting, especialy in dwelling-houses where common practice lags so deplorably behind recognised standards of the present day. It is true that these are not mandatory, but the very fact of their existence will be of immense value. Bad lighting is far more frequently due to ignorance than to "sinning against the light," and it is to be hoped that the fullest publicity will be given to these codes as they are issued, and that all the bodies, whether professional or commercial, who are interested in good lighting will co-operate in making this particular one widely known and adopted.

There will, of course, be the inevitable criticism from the "back-benchers," and from those with a "high resistance" to any attempt to improve the standard of living, that the values recommended are too high or even that they are inspired by commercial interests. The obvious answer is that the recommendations of values of illumination are identical with those of the Illuminating Engineering Society, so that any such criticism must be equally levelled at that body. The one exception is, as already mentioned, a *raising* of the standard for school classrooms to bring it more into conformity with the Board of Education's "Suggestions for the Planning of Buildings for Public Elementary Schools," *published in* 1936.

One criticism of the Code which, on the face of it, seems to be justified is that no account is taken of the probable rapid introduction of fluorescent lamps after the war. It is, however, difficult to see what could usefully have been included on that subject. There is at present no information available as to the standard sizes of lamps of this type likely to be available for domestic lighting, so that the best plan appears to be to rely on the frequent revision of the Code in order to ensure that it is always well abreast of progress. So far as schools are concerned, the form of illuminant is not mentioned, nor the type of lamp, so that the lighting engineer has a perfectly free hand to use gas or electricity, tungsten lamps or fluorescent lamps or anything he pleases so long as he obtains the necessary illumination and satisfies the other requirements as to diversity, freedom from glare, and all the other factors that go to make up a good, serviceable lighting installation.

PARSONS

RHODIUM PLATED METAL REFLECTORS

FOR SEARCHLIGHTS, FLOODLIGHTS, STREET LIGHTING UNITS, SPOTLIGHTS, SIGNAL LIGHTS, ETC.

Sole Licensees and Manufacturers for the British Empire under the Bart Process.

PARSONS Metal Reflectors are unbreakable and have an optical accuracy equal to the best glass reflectors.

ALSO MANUFACTURERS OF HIGH QUALITY SILVERED GLASS REFLECTORS.

Your enquiries are invited.

C. A. PARSONS & CO., LTD.,
NEWCASTLE-ON-TYNE, 6

London Office:
56, Victoria Street, Westminster, S.W.1

I.P.S. P.13885

I.E.S. Lighting Reconstruction Pamphlets

No. 1. Principles of Good Lighting.

No. 2. The Lighting of Public Buildings.

No. 3. The Lighting of Schools.

No. 4. Natural Lighting.

All may be obtained on application to The Illuminating Engineering Society, 32, Victoria-street, London, S.W.1.

Single copies, 1s. each, 9s. per doz., £3 per 100.

Others in preparation.

THE FACTORY OF THE FUTURE

and the office will be planned with meticulous care as regards the provision of artificial lighting facilities.

Vitreosil, pure fused silica, gave to pre-war developments its remarkably heat resistant and diffusing gas globes and the highly transparent envelopes of the super-pressure mercury lamps.

When the present job is finished we can contribute our added war-time experience in the production of this remarkable material.

Write to

THE SOLE DISTRIBUTORS LTD.
THERMAL SYNDICATE
Head Office: Wallsend, Northumberland.
London Depot: 12-14, Old Pye Street, Westminster, S.W.1.

The Value of Good Lighting

We are indebted to Mr. H. C. Weston for the following excerpt from a lecture delivered to the Royal Institute of Public Health and Hygiene, by Frank W. Law, M.A., M.D., F.R.C.S., (Ophthalmic Surgeon, Guy's Hospital), on Ophthalmology. The lecture is printed in full in the journal of the Institute, Vol. 7, No. 8, Aug. 1944, pp. 199-210.

In spite of the interest shown and the work done in the field of industrial and domestic lighting, very much remains to be done, and it is my impression, which I would rather hope is mistaken, that the unsatisfactory lighting conditions under which many people work and suffer are due, not so much to the difficulty of the problem they present, as to the lack of liaison between those willing to advise and those anxious—we hope, anxious—to learn and improve.

There is an active, up-to-date body, the Illuminating Engineering Society; this body has now, at the instigation of an ophthalmologist, a standing Physiological Committee. None the less I maintain that a great number of workers labour under illuminating conditions which leave a lot to be desired.

It has lately come to my notice that municipal bodies are taking an interest in the illumination of offices in this city, but in a rather misguided fashion. A patient upon whose eyes I recently operated returned to me complaining that, although he appeared to have completely recovered from the operation, he was unable to continue with his previous work, which was that of a bank clerk. It transpired that in his temporary absence the local authority had sent a representative round the neighbourhood of his office, who had insisted, upon grounds of economy, on the substitution of the electric bulbs then in use by bulbs of lower wattage. I submit that reducing illumination below the limits of efficiency in order to save what must be a relatively negligible quantity of fuel represents a very false form of economy, the exercise of which should not be within the unsupervised power of a municipal department or body. . .

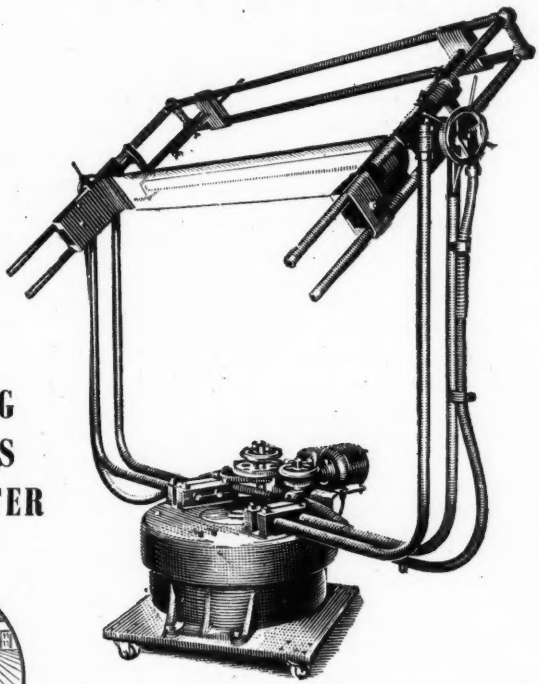
The sooner it is universally realised that adequate and carefully planned illumination for every occupation is the right of the worker and the responsibility of the employer, so much the sooner will the efficiency, happiness, health and well-being of the majority be enhanced.

Further, it is not a question which can be solved in the light of nature or by rule of thumb; I venture to suggest that anyone who has not studied the matter would be amazed at the complexity of the problem and the advances which have been made towards its solution. It is by no means merely a question of intensity of illumination which calls for attention, but (to mention but two of many aspects) such questions as glare, which may be defined as light in the wrong place, and the compensation for lack of help from shadows in working upon monochromatic fabric in diffuse illumination, provide examples of the many special problems which arise. Gone are the days when it was permissible for anyone to consider it reasonable to sit a dozen girls around a table to do fine sewing with a centrally hung unshaded inadequate lamp.

As with industrial, so with domestic lighting, the difference being that here the remedy is in the sufferer's own hands; yet how often do we find conditions far from perfect. The explanation, in my opinion, lies in the fact that while the actual problem of illumination, as such, in industrial conditions is complicated and difficult, in domestic conditions further complications arise when the illumination may have to serve different purposes for different people in the same room. Nothing is more restful and socially conducive than to converse in a subdued illumination; nothing is more irritating and harmful than to attempt to read, work or sew, in the same conditions in the same room.

The solution of the problem is certainly outside the scope of the average householder, and lies in the province of the illuminating engineer, who probably solves it by the provision of a diffuse general illumination augmented by local and more focal lighting for individual requirements, due attention being paid to the adequate shading of the illumination of the local areas from the eyes of those others in the room for whom they are not intended. The whole subject is full of difficulties and surprises; as an example of the latter it is most interesting to note the strange cheerless effect produced in domestic surroundings by intense diffuse or indirect illumination—an effect doubtless due to our reaction against the immediately appreciated anomaly of the absence of shadow in a high intensity of illumination.

RESEARCH BEHIND LIGHTING



BTH LIGHTING FITTINGS PHOTOMETER

This BTH-designed Laboratory device provides photometric information on Mazdalux Fittings. It consists of a turntable mounting two frames, each rotating on a different plane. A lighting fitting mounted in the inner frame is directed to a fixed photo-electric cell which records accurate candle-power readings at any angle. At least a thousand readings are necessary for a complete optical test of a single reflector.

Only by such means can fittings be designed for the very high standard of efficiency which characterises all BTH Lighting Equipment.

BTH RESEARCH AIDS INDUSTRY

BTH Research Laboratories have made an intensive study of both the physical and psychological aspect of lighting in war-time industry and their knowledge and experience are at the disposal of the principals of industrial undertakings through the Lighting Advisory Service.

MAZDA LAMPS

LIGHTING ADVISORY SERVICE

The British Thomson-Houston Co. Ltd., Crown House, Aldwych, London, W.C.2.

M 4009

Street Lighting and the War

(Communicated)

Notwithstanding the widespread adoption of lighting to the standard permitted by B.S.S. A.R.P./37, known familiarly as "star-lighting," and the more recent "moonglow" standard now in use at Liverpool, many installations have been virtually unattended during the war except for periodical painting of the columns.

A revival of popular interest is shown by the many recent references in the daily newspapers, and it is generally believed that authorities everywhere are busy behind the scenes preparing to get "lit up."

The small proportion of total equipment which has sustained damage and the favourable effect on public morale of street lighting make it desirable to consider the matter as being quite distinct from general war damage. Official sanction should be given immediately to put in hand repairs up to a financial limit proportional to the size and importance of individual installations, and their probable immunity from further damage by enemy action.

Irrespective of whether the installation is the property of a private company or a public body, the whole, or a generous part, of the cost should be met by a special grant under the aegis of the Ministry of Home Security; although it may be disbursed through the channels of the Electricity Commission and the appropriate body for the gas industry.

Details of the effects of war-time conditions on installations would be of interest to all concerned and should be made available now, to guide operating engineers and manufacturers of equipment in the matters of future practice and design.

Some observations are given on the impact of war on an installation in a heavily raided industrial district, and it is hoped that others will be forthcoming from responsible authorities. This particular installation consists of H.P.M.V. lamps carried on steel and concrete columns.

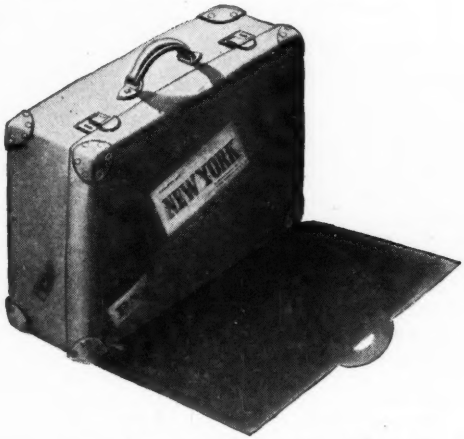
A short time after going out of lighting it was found that excessive deterioration was taking place in large concrete columns, whilst the steel and small concrete columns kept the apparatus reasonably dry. The large columns provide a much larger air-space around the equipment than do the other types, and perhaps more significantly, their brackets are an air-tight fit over the tops of the poles, so that there is no "chimney effect" in this design. Whatever the correct explanation may be, it was soon found that all chokes had to be removed from this type and removed to dry storage. Time switches were left in position as it was thought that their tightly sealed cases afforded good protection: but they suffered severely from damp in the large concrete columns.

In spite of the "black-out," the damage due to the ordinary hazards of collision has been no greater than that normally experienced in peace-time, and, in fact, only one collision has occurred during hours of darkness.

The manner in which equipment has withstood blast effects is remarkable. In some instances the lamp columns are the only erections to remain undamaged in the vicinity of a bomb burst. Chokes and condensers have been perforated by fragmentation, but in all cases it has been possible to renew doors with others salvaged from columns otherwise destroyed.

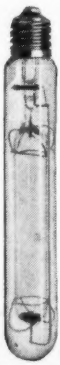
Concrete columns damaged by low-level machine-gunning and fragmentation have been repaired by patching. Sometimes all the concrete has been removed from the reinforcement, but successful repairs have been effected where this has occurred, up to a length of 18 in. in a column otherwise intact. Concrete bracket arms have been similarly repaired by fixing a wooden former around

MORE LIGHT ON THINGS TO COME . . .



When you need no longer 'keep it dark'

When the lights go on again they will be better lights. The war has seen important progress in the science of lighting. And when these improvements are released for general use you can rely upon finding them all in Crompton Lamps.



CROMPTON LAMPS

for the LATEST in lighting

CROMPTON PARKINSON LIMITED. **ELECTRA HOUSE, VICTORIA EMBANKMENT, LONDON, W.C.2**

Telephone : TEMple Bar 5911 *Telegrams : Crompark, Estrand, London*

the existing reinforcement, and working from the standard type of tower ladder.

Small perforations in steel columns have been filled by oxy-acetylene welding, in situ, and in one case a steel plate has been welded over a hole of about 3 in. diameter.

One steel column which had been bent through an angle of about 5 deg. from the vertical was successfully straightened, in situ, by an ordinary "Jim Crow" cramp.

One lantern, found to be hanging by its flexible cable from a bracket arm, had its point of attachment severed by a missile. The lantern and column were quite intact and the lamp lighted when a fuse was inserted. Many instances have occurred of lantern glassware being completely destroyed, leaving bulbs intact and serviceable: and in other cases concussion has fractured the outer envelopes of H.P.M.V. lamps which have burned on test for some hours before being detected by inspection.

The abnormal conditions have emphasised a few weaknesses in design. Wrought-iron brackets, in the vertical plane, fracture at the thread joining them to the boss which fits over the spigot on a small concrete column: with the result that the arm, retained by its flexible cable, swings through 180 deg. and crashes against the post and destroys the lantern. A slight increase of strength at this critical point would obviate this and would have lowered to a considerable extent the amount of damage which has been sustained.

Lanterns having flat glass surfaces have suffered considerably from blast at great distances from explosions, whereas those with a cylindrical bowl type of glassware have in most instances remained intact even when the premises adjacent have been destroyed.

Pooling of this kind of experience will be of value to designers, providers, and users of street lighting equipment, so that our post-war installations may be of an even higher standard than hitherto —and that is saying a great deal.

Since the above was written the public has been informed by the daily Press and radio that from September 17 street lighting would be permitted to an intensity of 100 times that of B.S.S. ARP/37.

Where centralised control allowed the simultaneous extinction of all lamps it was generously conceded that an intensity 10 times greater still would be allowed. One provincial authority wisely ruled that the sudden extinction of lighting to such a standard (0.2 ft.c.) constituted a danger to safety and morale, and refused to avail itself of the concession. It is to be regretted that the Ministry chose to make such an announcement, apparently without taking the lighting authorities into its confidence.

Where existing "star-lighting" is affected, a simple adjustment of the fittings is all that is called for. But there are many areas where no lighting has been provided: and in view of the considered statements of the I.E.S. and the M.O.T., in the past, on the danger of "pools of darkness," improved lighting in some districts and none at all in adjacent ones can hardly be considered to be in the interest of road safety.

If matters are allowed to rest, the good sense of the man in the street is likely to give rise to a clamour for "all or nothing." E. H. J.

E.L.M.A. Lighting Service Bureau

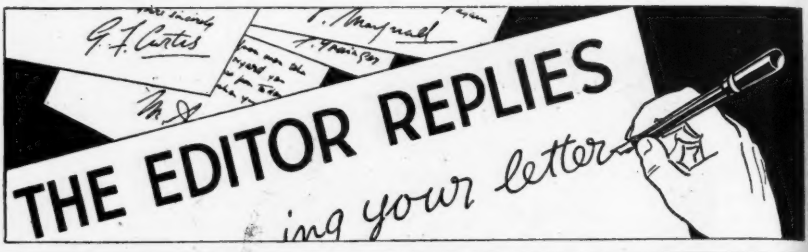
Mr. E. B. Sawyer Appointed Acting Manager

Readers will learn with interest of the appointment of Mr. E. B. Sawyer as acting manager of the Lighting Service Bureau in succession to Mr. H. Lingard. Mr. Sawyer has done excellent work at Savoy Hill during the war, including service to the National Industrial Lighting Service. Mr. Sawyer is senior training officer with the rank of Captain in the Middlesex Battalion of the Home Guard. He is also a member of the Council of the I.E.S.—many members of which will wish to join us in conveying congratulations on his new appointment.

Once upon a time the only metal that could be sealed into glass was platinum. Chance research workers and craftsmen have produced glasses into which other metals can be sealed. This has made possible mercury arc rectifiers, large cathode ray tubes and new radio valves. Successful marriages of this kind are all in the day's work to Chance Brothers—have any manufacturers a 'girl' who looks like being left on the shelf?

FOR SCIENCE, INDUSTRY AND THE HOME ***CHANCE GLASS***

CHANCE BROTHERS LIMITED, Glass-Makers since 1824, Produce Rolled Plate, Wired Glass, Pressed Glassware, Laboratory Glassware, Architectural, Decorative and Lighting Glassware, Optical Glass, Scientific and other specialised Glass Products, Marine and Aviation Lighting Equipment. Head Office: SMETHWICK. BIRMINGHAM. London Office: 10, PRINCES ST., WESTMINSTER, S.W.1.



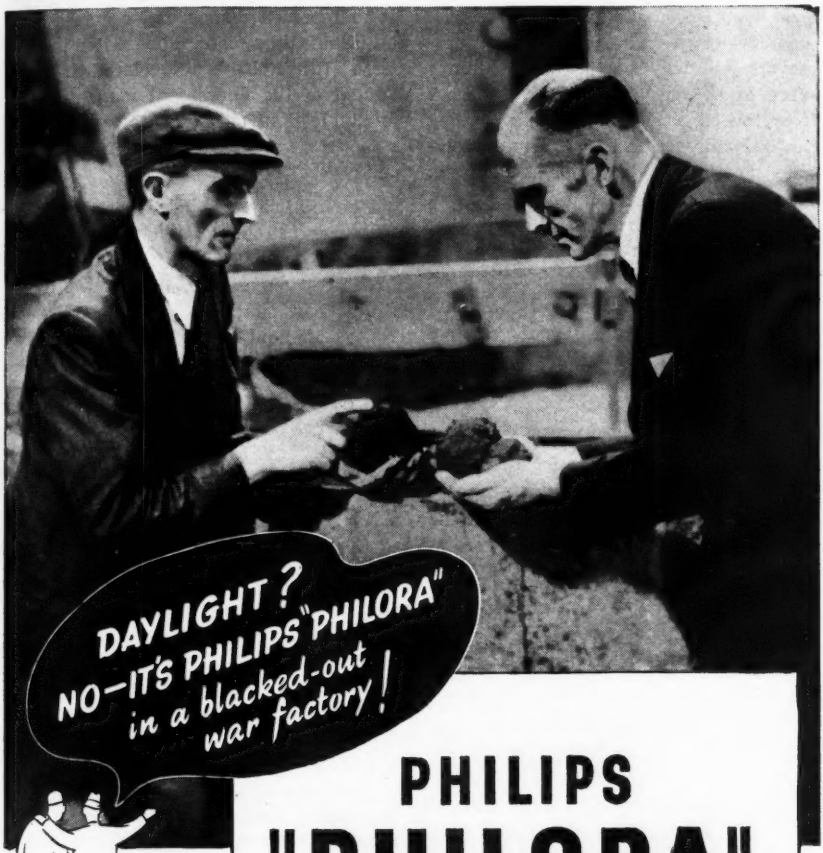
I have had a letter from Mr. E. W. Murray, commenting upon my recent remarks on **limits to glare**. He, too, stresses the fact that glare is chiefly a matter of contrast, irrespective of brightness. Although factory lighting regulations permit sources whose brightness does not exceed 10 candles per sq. in. to be exposed to the eye this, of course, is no guarantee that sources having a brightness even less than this will not cause glare in feebly lighted surroundings. The increase of the original limit of 5 candles to 10 candles per sq. in. was itself a recognition that an increased brightness might accompany a higher standard of lighting. There is much to be said, in fact, for a rule making the allowable brightness of sources related (but not necessarily proportional) to the order of illumination provided.

Mr. Murray cites the case of the miner's lamp, the feeble brightness of which can cause most troublesome glare in the darkness of the mine. He also emphasises the importance of **grading the illumination**, whenever a transition from great brightness to relative obscurity is made: this is more important in passing from light to dark surroundings than in the reverse case, because the eye seems to adapt itself more quickly to brighter conditions than it does to the converse.

All this is very true and illustrates the need for action in all those cases where, owing to the existence of light-locks, **sudden transitions from brightness to darkness** occur—the worst condition being, as Mr. Murray points out, when one steps from bright outdoor sunshine on to a dimly lighted stairway. Now that some alleviation of the black-out is promised, this is surely one of the first things to be remedied—for if increased street lighting and windows protected only by light blinds are permissible surely the risk involved in relieving the conditions characteristic of these light-locks must be considered infinitesimal.

The problem of **the lighting of drawing offices** continues to excite interest. I have explained recently why no detailed specification is advisable, though there are certain weaknesses—an unduly dark background in comparison with the brightly lighted board, for example—that one must be careful to avoid. I have recently visited drawing offices, in which the conventional arrangement of **fluorescent lamps parallel to the line of benches** and slightly in front of each row of workers seemed to answer very well. I could not discover evidence of any inconvenience owing to "linear shadows," and I am coming to the conclusion that the unsightly "staggered" arrangements of lamps designed to avoid such shadows from the edges of implements are not really necessary.

I have observed, however, that the



True photographic representation

PHILIPS
"PHILORA"
(REGD. TRADE MARK)
FLUORESCENT
MERCURY OR SODIUM
DISCHARGE LIGHTING

Serves the Nation

PHILIPS LAMPS LTD.
("PHILORA" DEPT.)
CENTURY HOUSE
SHAFTESBURY AVENUE
LONDON W.C.2

(81A)

liking for **an adjustable well-screened local lamp**—even a filament lamp supplementary to general lighting from fluorescents—is deep-seated. Such lamps serve to eliminate completely shadows from the edges of instruments as they can be manipulated to suit any conceivable position of ruler or set-square. There is also a belief that whilst general lighting is adequate for the illumination of drawing paper, it does not always meet the case **for tracing.** This is attributed partly to direct reflection off the shiny surface of the cloth, which may prove distracting even when the source is of low brightness. It seems also to be thought that the angle at which light strikes the surface (which again can be altered with an adjustable local lamp) is of importance in securing penetration of the shiny tracing cloth and enabling the lines below to be clearly seen.

Visits to these and other installations of fluorescent lamps have confirmed my belief that the practice of mounting these lamps in opaque reflectors at a level of, say, 4 ft. to 5 ft. above the working plane is inadvisable. The lamps may thus be brought too nearly into the direct range of view of the workers and the general effect is unsightly. When lamps are **mounted near ceiling-level** and provided with the more pleasing translucent shade the general effect is much better, and the loss in illumination cannot be great—at least in rooms of ordinary dimensions.

I have been asked some questions about the application of **utilisation factors**—a subject which, I understand, is amongst those which the I.E.S. hopes to discuss this season. It has been suggested, on the one hand, that the data presented in handbooks are too elaborate, and, on the other, that really intricate installations, utilising reflection from recessed domes and cornices and unusual fittings, cannot be treated in this way. It has also been declared that the advent of the fluorescent lamp renders available data obsolete.

I have always thought that, for ordinary average installations, the process could be greatly simplified. **Mr. Weston's two ingenious diagrams*** have shown how simple the calculation may be for filament lamps. Mr. Atkinson's recent work has shown how to cope with fluorescent lamps.† No doubt in this case also (on certain conditions) further simplification is possible.

The treatment of highly elaborate decorative installations is another problem. But even here, I believe, provided the requisite data in regard to performances of fittings and the nature of surroundings are available, exact calculations can be made.

Situations Vacant

CHEMIST required for manufacture of and research into Fluorescent Material. Experience in this field or in Inorganic Analysis of Traces an advantage. Excellent post-war prospects. Write Box C.M.8, c.o. 5, New Bridge-street, London, E.C.4.

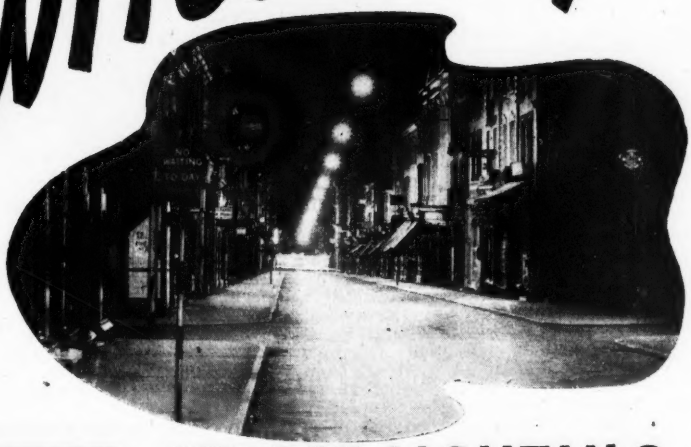
PRODUCTION SUPERVISOR required for Lamp Factory Extension. Experience in Discharge Lamp or other Lamp Production preferred. Excellent post-war prospects. Write Box C.S.4, c.o. New Bridge-street, London, E.C.4.

*"Light and Lighting," Oct., 1942, p. 133; Nov., 1942, p. 138.

†Fluorescent Lighting, by A. D. S. Atkinson. (Geo. Newnes, Ltd. 1944.)

WHEN THE PRIME MINISTER says

SWITCH ON!



Revo

STREET LIGHTING EQUIPMENT

will come into its own again

IN hundreds of Cities and Towns throughout the country Revo Street Lighting Equipment will be there to restore one of the most desired comforts of peace. Others will urgently require new installations. Be ready. **PLAN NOW** for post-war street lighting and ask our Illuminating Engineers for their assistance. There is no obligation.

REVO ELECTRIC Co. Ltd. TIPTON, Staffs.

The Lighting of a Lecture Theatre

Opinions may differ as to the best method or *even* a good method of lighting a lecture theatre. Apart from any consideration of the actual illumination provided, the first essential must be the absolute avoidance of glare, as nothing so quickly distracts the attention as exposed or unduly bright light sources. There is the further consideration that in a lecture theatre all those who use the room are continuously facing the same direction. Any troublesome glare is thus encountered *all the time* and is more distressing than it would be in a room in which people were constantly moving about and altering their viewpoint.

Showing the lighting of a Lecture Theatre at the King Edward VII. Nautical School, Commercial Road, London, E.14

The photograph depicts a lecture theatre, the replanned lighting of which was carried out by means of Glassteel diffusers with 150-watt Standard Tungsten filament lamps, diffusers mounted at 12 ft. 6 in. from floor level, ceiling height being 18 ft. The mounting height gives a completely uninterrupted view of the lecturer, blackboard, charts, etc. The illumination intensity is approximately 14 to 15 foot-candles, with a pleasing very smooth result, devoid of any harsh shadows.

The chart bench running the whole length of the theatre has local lighting by means of 40-watt standard tungsten filament lamps in intensive type reflectors on "Invisaflex" adjustable arm fittings.

The lecture theatre is that of the King Edward VII. Nautical School at 680, Commercial-road, London, E.14, where officers are trained for the Merchant Navy.

The lighting was planned by the Illuminating Engineering Department of Siemens Electric Lamps and Supplies, Ltd., in collaboration with the architects, Messrs. George Baines and Son, chartered architects, 156, Preston-road, Wembley.

Fluorescent Lighting in a War Factory

The accompanying illustration shows a section of the coil winding shop in an important war factory, which has recently been completely relighted. This room is lighted by Philips fluorescent lamps in Maxlume reflectors situated 5 ft. over the working plane and giving 20-25 foot-candles. Attention may be drawn to the soft shadows and the good working conditions, which have led to an increase in output. Similar methods have been adopted for the lighting of the drawing office, one fitting being installed immediately over each board. The installation was carried out by Messrs. Pinching and Walton, Ltd.

King
E.14

ting-
sten
re-
able

the
l at
E.14,
Mer-

the
t of
lies,
rchi-
Son,
oad,